

STANDARD OPERATING PROCEDURE:

Handling dry ice (solid carbon dioxide)

Note: To be undertaken only by trained personnel in conjunction with a current Safety Data Sheet (SDS) and site-specific risk assessment.

1. Introduction

Dry ice is solid carbon dioxide (CO₂). Under normal classroom conditions dry ice changes directly from the solid to carbon dioxide gas, without going through the liquid phase. The phase change of a solid transforming directly into a gas, without passing through the liquid phase, is called sublimation. The properties of dry ice and carbon dioxide form the basis for many interesting classroom demonstrations such as the process of sublimation, cryogenics, fog effects and extinguishing a flame.

2. Context

- These instructions are for the use of experienced science teachers and technicians only.
- The use of dry ice is for demonstration purposes only.

3. Safety Notes

- The sublimation temperature of dry ice is -78.5°C. Contact of dry ice with the skin may result in frostbite or cold burns.
- Dry ice must be used and stored in a well-ventilated area. A concentration of carbon dioxide in air of greater than 1.5% can cause headache, nausea and vomiting and may lead to unconsciousness.
- Dry ice should be stored in an insulated and secure container, which has a loose-fitting lid (e.g. a foam cooler box). Containers should be vented periodically to avoid the build-up of gas. Dry ice must not be stored in a sealed container as the build-up of pressure from sublimation could cause the container to rupture or explode.
- Dry ice may be stored in a running fume cupboard if ventilation is otherwise inadequate.
- Protect eyes, face and skin from contact with dry ice. Safety glasses, thermally insulated gloves, a lab coat and closed shoes should be worn and tongs should be used to pick up pieces of dry ice.
- Carbon dioxide is more dense than air and may accumulate in low, confined spaces with poor ventilation.
- Dry ice is not classified into any hazard class in the GHS. However, the Safe Work Australia *Labelling of Hazardous Chemicals* Code of Practice recommends that containers be labelled with the quantity of dry ice contained and information regarding the asphyxiation hazard and safe handling to avoid cold burns. See the Code of Practice for examples of labels for containers of dry ice.

- Transport in a private vehicle should be avoided; where possible, delivery of dry ice should be arranged with the supplier. If the dry ice is to be transported in a private vehicle, only small amounts (up to 5kg) at a time should be purchased. The dry ice should be collected in an insulated container with a loose-fitting lid and the container securely placed in a compartment of the vehicle, which is segregated from the driver's compartment. Good ventilation to the driver's compartment must be ensured in case of leakage of carbon dioxide gas into the driver's compartment.

4. Regulations, Licences and Permits

Not applicable

5. Equipment

- Insulated storage container, such as a foam cooler box
- Tongs
- PPE: safety glasses, thermally insulated gloves, lab coat or overalls, closed shoes
- Safety screen for use in class demonstrations

6. Operating Procedure

1. Wear PPE and work in a well-ventilated area.
2. Avoid cold burns by wearing gloves and using tongs to pick up pieces of dry ice.

7. Trouble shooting/Emergencies

- First Aid: See latest SDS for more detailed information
 - In case of frostbite or cold burns, flush skin with warm (30°C) water for 15 minutes. Apply a sterile dressing. Seek medical attention. Do not apply hot water or radiant heat.
 - In case of contact with the eye, irrigate eye with tepid water for 15 minutes. Seek medical attention immediately.
 - In case of inhalation, remove patient to well-ventilated area. Apply artificial respiration if not breathing. Seek medical attention.
 - For further advice contact the Poisons Information Centre on 131126.

8. Waste Disposal

- Unused dry ice may be allowed to sublime in a well-ventilated area.

9. Related Material

- SDS
- Risk Assessment.

References:

Safe Work Australia. 2011. 'Model Code of Practice Labelling of Hazardous Chemicals'
<http://www.safeworkaustralia.gov.au/sites/swa/about/publications/pages/labelling-hazardous-chemicals-cop> (Accessed April 2014)

Air Liquide Australia Limited, Material Safety Data Sheet AL066:
Carbon dioxide, solid (CO₂), Dry Ice, Revised edition number 7, MSDS date 8 November 2012.
<http://docs.airliquide.com.au/msdsau/AL066.pdf>

Risk Management Technologies, Perth, WA, BOC Limited (Australia)
Safety Data Sheet #033: Solid Carbon dioxide, Revision 2, SDS date 8 January 2014
http://msds.chemicalert.com/?id=21&file=0008513_001_001.pdf

Information on the properties and uses of dry ice:
<http://science.howstuffworks.com/innovation/science-questions/question264.htm>